Quality Assurance Audit Report

Technical Systems Audit
Sinclair Wyoming Refining Company

Ambient Air Monitoring Program

May 22-29, 2019

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Executive Summary

This report presents the results of the 2019 Technical Systems Audit (TSA) of Sinclair Wyoming Refining Company (Sinclair) Ambient Air Monitoring Program conducted by the United States Environmental Protection Agency (EPA) Region 8 in May of 2019. 40 Code of Federal Regulations (CFR) part 58 appendix A, §2.5 requires TSAs to be performed once every 3 years on PQAOs producing regulatory data. This is the first TSA performed on the Sinclair's Ambient Air Monitoring Program.

The purpose of this TSA is to assess Sinclair's Ambient Air Monitoring Program to determine its compliance with established regulations and guidance governing the collection, analysis, validation and reporting of ambient air quality data. This was accomplished through the review of a pre-audit questionnaire, the review of quality system documents, interviews with Sinclair staff, interviews with their contractor (AECOM) staff, observations of data and records and the on-site inspections of the three monitoring stations.

Issues identified during the TSA are detailed in this report as TSA findings. All findings are categorized in one of four tiers. These tiers are major findings, minor findings, concerns and observations. A major finding is a nonconformance with or absence of a specified requirement (regulatory, QMP, QMP/QAPP, SOP, etc.) or a deviation from guidance that has or could significantly impact data quality and likely affects the validity of ambient air data submitted to AQS. A minor finding is a nonconformance with or absence of a specified requirement or a deviation from guidance that is not currently affecting the validity of ambient air data submitted to AQS. A concern is an identified practice with a potentially detrimental effect on the ambient air monitoring program's operational effectiveness or the quality of sampling or measurement results. And lastly, an observation is an item identified during the TSA that does not violate any established guidance or regulation, but for which the auditor noted a potential for improvement.

This report summarizes the 2019 Sinclair TSA, details each identified finding and presents recommended corrective actions. A list of the major findings, minor findings, and concerns are presented in the table below.

Major Findings	
1)	Zero check action limit in the QMP/QAPP is greater than the data validation acceptance limit.
Minor Finding	
1)	Incorrect calibrator mass flow controller calibration/verification frequency and inaccurate reporting.
2)	South West monitoring station inlet too close to the shelter.
3)	Inlets and sampling train contain unapproved materials.
4)	The shelter temperature probes are not verified as detailed and required in the data validation template.
5)	Two gas standard cylinders are in the incorrect shelters.
6)	Maintenance records are not thorough and organized.
7)	There is a lack of training and training documentation.
8)	Performance Evaluations and NPAP audits are not conducted with independent personnel and equipment.
9)	Incomplete data quality systems audits.
10)	Calibration action limits have been exceeded without any recorded corrective action.
11)	Corrective actions are not initiated in a timely manner.
12)	Quarterly reports have multiple errors on the calibration dates.
13)	Zero air generators are not challenged on a regular basis as detailed in the QA Handbook Volume II.
Concerns	
1)	It appears the South West station needs more frequent maintenance.
2)	The monitoring shelters are missing documentation and contain obsolete documentation.
3)	There is poor shelter maintenance and cleanliness.
4)	Sampling conduit appears to be open from the shelter to the inlet at two sites.

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1. Background

A TSA is an on-site review and inspection of a monitoring organization's ambient air monitoring program to assess its compliance with established regulations and guidance governing the collection, analysis, validation and reporting of ambient air quality data. A TSA is also an opportunity to highlight areas within a monitoring agency where it has shown innovation and improvement, to identify areas where programs can be strengthened and to provide feedback to the agency.

TSAs are required under 40 Code of Federal Regulations (CFR) part 58 appendix A §2.5 which states "Technical systems audits of each PQAO shall be conducted at least every 3 years by the appropriate EPA Regional Office and reported to the AQS. If a PQAO is made up of more than one monitoring organization, all monitoring organizations in the PQAO should be audited within 6 years (two TSA cycles of the PQAO). As an example, if a state has five local monitoring organizations that are consolidated under one PQAO, all five local monitoring organizations should receive a technical systems audit within a 6-year period. Systems audit programs are described in reference 10 of this appendix."[1] The Sinclair operates as an independent Primary Quality Assurance Organization (PQAO), and therefore must be audited once every 3 years.

The EPA Region 8 sent two auditors to perform this TSA, Ethan Brown and Albion Carlson. Ethan Brown was the lead auditor and Albion Carlson provided assistance. To initiate the 2019 Sinclair TSA, the auditor reviewed the project quality system documents such as the quality management plan and quality assurance project plan (QMP/QAPP) and the standard operating procedures (SOPs). The auditor then sent an introductory email to Michelle Serres on March 1, 2019 and followed up with blank TSA Questionnaire on March 15, 2019. A preliminary TSA schedule was agreed upon, and the completed questionnaire was returned on April 19, 2019.

The on-site portion of the TSA consisted of sites visits (May 22 and 23, 2019) and a visit to AECOM in Fort Collins Colorado (May 28, 2019). The site visits consisted of an inspection of all three monitoring sites (Figure 1) including the instruments, analyzers, documents, records and data stored within. Region 8 auditors also conducted entrance meetings at Sinclair with Sinclair employees and again at the AECOM office with the AECOM project employees.

Following the on-site portion of the TSA, the auditors conducted a close-out meeting via phone with the Michelle Serres of Sinclair and Anthony Galligan of AECOM. During this close-out, the preliminary findings, concerns and observations were presented.

2. Project Organization and Management

Sinclair contracts AECOM to install, maintain and operate the Sinclair ambient air monitoring stations. Michelle Serres is the Sinclair Project Manager and Anthony Galligan is the AECOM Project Manager. AECOM manages all site activities and contracts Environmental, Engineering and Measurement Services (EEMS) to perform independent performance audits at each site every quarter. Other project staff are presented in Figure 2.

[1] Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Quality Monitoring Program Quality System Development. EPA-454/B-17-001, January 2017.

3. Laboratory

There are no project activities that require a laboratory to produce sample data.

4. Facilities

Michelle Serres works at the Sinclair Refinery, but there are no additional project facilities located at the refinery besides the three air monitoring stations. The Anthony Galligan and Dustin Rapp work out of the AECOM office in Fort Collins, and both electronic and hard-copy records are stored there. EEMS operates and maintains all audit equipment.

5. Data and Records

Station Log and Analyzer Checklist sheets are completed on-site, and a copy of each is maintained in the shelters. The original sheets are then shipped to AECOM in Fort Collins.

Air monitoring data are stored on-site in the station dataloggers, and are collected via remote communications by a computer at the AECOM office in Fort Collins. Data are generally uploaded hourly from each site. Microsoft Excel is used to aggregate data and apply automatic formatting to inform data validators. Once validated, data are included in quarterly reports that are sent to Wyoming Department of Environmental Quality (DEQ) and data files are uploaded by DEQ to the EPA's Air Quality System (AQS) within 90 days following the quarter.

6. Site Visits

The following sites were visited during the Sinclair TSA: In-Town (Figure 3), North East (Figure 4) and South West (Figure 5). Table 1 lists the AQS Code, monitored parameters, and methods for each site.

Table 1. Sinclair sites visited during the TSA.

Site	***AQS ID***	***Parameters***	***Methods***
In-Town	56-007-0008	SO_2	Thermo Model 43i
North East	56-007-0009	SO_2 NO_2	Thermo iQ Series 43 Thermo iQ Series 42
South West	56-007-0010	SO_2	Thermo Model 43i

7. Conclusions and Recommendations

A number of findings were identified during the TSA. These items are documented below, and have been divided into major findings, minor findings, and concerns. A major finding is a nonconformance with or absence of a specified requirement (regulatory, QMP, QMP/QAPP, SOP, etc.) or a deviation from guidance that could significantly impact data quality and likely affects the validity of ambient air data submitted to AQS. A minor finding is a nonconformance with or absence of a specified requirement or a deviation from guidance that is not currently affecting the validity of ambient air data submitted to AQS. A concern is an identified practice with a potentially detrimental effect on the ambient air monitoring program's operational effectiveness or the quality of sampling or measurement results. The findings and concerns are accompanied with a discussion of the details pertaining to the item and a recommendation for resolution.

After receiving this report, Sinclair is expected to produce a corrective action plan within 30 days. This plan will need to provide a path and clear timeline for resolving these findings.

7.1. Major Findings

1) **Zero check action limit in the QMP/QAPP is greater than the data validation acceptance limit.**

   The Sinclair QMP/QAPP Section B.5.2.4 indicates that the action limit for zero checks is 1.5% of the analyzer's full scale. The latest cal sheets show that the SO_2 full scale is 500 ppb, so 1.5% of this value would be 7.5 ppb. 7.5 ppb is larger than the zero acceptance limit in the data validation template[2] and those values presented in Table 16 of the QMP/QAPP (both of which are < ±3.1 ppb per day or < ±5.1 ppb over two weeks).

   Review of the 2016, 2017, and 2018 quarterly data reports revealed periods of data where the zero checks exceeded the QMP/QAPP and validation template acceptance criteria (Figures 6, 7, 8, and 9). The data associated with these bad QC checks were not invalidated or otherwise flagged. The majority of these acceptance limit exceedances were at the North East site, but exceedances were noted at the In-Town Station as well.

   As shown in Figure 6, the North East Station had numerous occasions where the SO_2 zero-check values fell well above 3.1 ppb. The analyzer was allowed to operate like this for weeks (and sometimes months) at a time. A number of checks even fall above 5.1 ppb, which would be the limit for biweekly checks. The effect on the data is obvious from the plot. The hourly SO_2 concentrations have a direct and proportional relationship with the zero-check results. The NOx analyzer also had exceedances of the data validation limits (Figure 7), although the excursions occurred over shorter periods than for the SO_2.

   Zero and span checks are critical criteria in the data validation template. This means that when the acceptance criteria are exceeded the data should be invalidated unless compelling evidence to the contrary exists. None of the routine data associated with the identified failing checks are flagged or invalidated in AQS.

   Three additional quality checks could provide some compelling evidence that these data are still good: Performance Evaluations, NPAP audits, and calibration verification records. For the Sinclair project, there is less evidence than usual because the Performance Evaluations and NPAP audits were conducted with the same personnel and standards (see Minor Finding #8). Additionally, for the North East Station, instead of providing compelling evidence that the data are of good quality, the SO_2 audits confirm the performance issues indicated by the zero-check data. For example, the NPAP/Performance Evaluation completed on March 8, 2017 shows that the station failed the lowest audit point and had a warning on audit level 5. The auditor noted that "It was observed that the monitor display values did not match the logger values by as much as 6 ppb, indicating that the monitor analog output signals require calibration." The audits conducted on June 5, 2017 and September 22, 2017 also showed warnings on audit level 5. Finally, the

[2] Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Quality Monitoring Program, Appendix D, Measurement Quality Objectives and Validation Templates, March 2017.

audit conducted on November 29, 2017 shows a warning on audit level 6, and a fail on audit level 5.

Similarly, the calibration verifications don't provide enough compelling evidence that the North East Station SO_2 data are of good quality. There were issues with some of the mass flow controller (MFC) calibrations associated with the verifications (see Minor Finding #1), the concentration of the gas standard used for the verifications is questionable (see Minor Finding #5), and the January 24, 2017 verification exceeded the action limit on the lowest verification point.

Recommendation: The QMP/QAPP needs to spell out how the team keeps analyzers in control. This typically consists of identifying and implementing an action limit that is less than the acceptance criteria. The QMP/QAPP should specify what actions are taken to correct the issue when action limits are reached and how the data will be validated or invalidated when acceptance criteria are exceeded.

Additionally, due to the lack of evidence to demonstrate all the SO_2 data at the North East Station are of acceptable quality, all data with failing zero-checks should be invalidated in AQS unless there is compelling evidence that the data are of acceptable quality. Data invalidation should also be performed for the other stations and analyzers affected by this finding.

7.2. Minor Findings

1) **Incorrect calibrator mass flow controller calibration/verification frequency and inaccurate reporting.**

Although the operational section of the data validation template requires gas dilution systems be verified/calibrated every 365 days (or after a failure of the 1-point QC check or performance evaluation), the QMP/QAPP indicates that the station gas dilution system MFCs are to be calibrated on a quarterly basis (QMP/QAPP Table 25). Furthermore, SOP CAL-020 is explicit that the calibration unit must be calibrated in place at least every 3 months after installation (along with additional conditions). The completed questionnaire and Anthony Galligan both indicated that the MFCs are to be verified/calibrated on a quarterly basis during the on-site audit.

Upon examination of quarterly data reports, it appears that there have been multiple quarters where the MFCs were not verified/calibrated as required. Even more concerning, the Mass Flow Controller Calibration/Audit Forms for the missing verifications are dated with the expected date on the top of the forms but populated with data from prior quarters. This is misleading and difficult to identify unless you compare the individual data points from multiple quarterly forms. This practice was used at all three monitoring sites. Table 2 shows which dates were affected at the North East monitoring site.

Table 2. North East mass flow controller calibration/audit form information.

Date on Top of Mass Flow Controller Calibration/Audit Form	Date the Data was Actually Collected
2/24/2016	2/24/2016
5/25/2016	5/25/2016
8/30/2016	8/30/2016
11/10/2016	**8/30/2016**
1/24/2017	1/24/2017
5/17/2017	5/17/2017
8/8/2017	8/8/2017
11/16/2017	**8/8/2017**
1/30/2018	**8/8/2017**
4/17/2018	4/17/2018
7/25/2018	**4/17/2018**
11/20/2018	11/20/2018

Recommendation: Because the project MFCs were always calibrated at least once a year, and the operational section of the Data Validation Template requires gas dilution systems be verified/calibrated every 365 days (or after a failure of the 1-point QC check or performance evaluation), this finding was classified as a minor finding. The practice used deviates from the QMP/QAPP, but data need not be invalidated for this finding alone.

Even though this finding doesn't result in data invalidation, it does indicate there are potential issues with field technician training (see Minor Finding 7) and QA oversight. The technician should have known that they were responsible for quarterly MFC calibrations and not just copying data from prior quarters and putting a new date on the top of the form. Managers and QA staff should have thoroughly reviewed these forms and verified that the technician completed their work as directed. The reviewers should have noted that the current date and the "Last Cal Date" entered on the forms hinted that there was an issue with the data.

Each calibration form has a location to document manager review and approval. These lines were often left blank in the quarterly reports. The QMP/QAPP should detail how and when the managers will review the forms, and these reviews should always be documented on the forms.

2) South West monitoring station inlet too close to the shelter.

The gaseous inlet was too close to the shelter at the South West monitoring station (Figure 10). Table E-4 of appendix E to 40 CFR part 58 states that "Horizontal and vertical distance to supporting structures to probe inlet, or 90% of monitoring path must be greater than 1 meter." The South West station inlet was found to be 0.78 m above the roof of the shelter. This measurement was taken from the bottom of the rain shield to the roof, as this is where the ambient air enters the sample train.

Recommendation: Sinclair should raise the inlet so that it is at least one meter above the supporting structure.

3) Inlets and sampling train contain unapproved materials.

40 CFR Part 58 Appendix E is titled Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring. Section 9 within Appendix E details what probe materials are suitable for sampling reactive gases. It states that "borosilicate glass, FEP Teflon or their equivalent must be the only material in the sampling train (from inlet probe to the back of the analyzer) that can be in contact with the ambient air sample for existing and new SLAMs."

The auditors identified several unacceptable materials in the sample train. The South West site has quarter inch teflon that extends up into a Sabio funnel made from polyethlene (Figure 10 and 11). Since the sampling probe extends into the rain cover, all materials in this cover must also be borosilicate glass or FEP Teflon. The North East site has screen material in the inlet housing (Figure 12). In addition, there is are stainless steel T's in this inlet housing and in the sample lines.

Lastly, the auditor was told that the rain covers at the In-Town and North East sites were teflon coated but never received any paperwork or manufacturer's description of these covers.

Recommendation: Sinclair should replace all material in the inlet or sample train that is not borosilicate glass or FEP Teflon. This may require adjusting or installing new inlets at all three sites. Please send the manufacturer's information on the North East and In-Town station covers to the auditors or replace the current setup with appropriate materials.

4) Shelter temperature probes are not verified as detailed and required in the data validation template.

To ensure the shelter temperature range and control requirements are met, the shelters must have verified shelter temperature probes. The three sites at Sinclair have shelter temperature probes built into the data loggers. The standard method for temperature probe verification consists of submersing the test probes and standards in a water bath. This is not possible when the temperature probes are built into a datalogger.

Recommendation: Sinclair should install separate shelter temperature probes and verify the shelter temperature probes on a regular basis to determine if they are within the acceptance limits specified in the data validation template. The data validation template specifies acceptance criteria of ≤ 2.1 degrees C of the standard. It also specifies these verifications should be performed at a frequency of 180 days and 2 times a calendar year.

5) Two gas standard cylinders are in the incorrect shelters.

The three Sinclair stations have gas cylinders that contain certified concentrations of SO_2 and/or NO/NOx. During the audit it was noted that calibration sheets for the In-Town Station indicated that tank LL170148 with an SO_2 concentration of 43.27 ppm was installed in the shelter, but upon inspection the station had tank LL170080 with an SO_2 concentration of 43.13 ppm. Similarly, the calibration sheets for the South West Station indicated that tank LL170080 with an SO_2 concentration of 43.13 ppm was installed in the shelter, but upon inspection the station had tank LL170148 with an SO_2 concentration of 43.27 ppm.

Recommendation: Going forward, all sheets should be completed accurately. When project staff are on site and filling out forms, they should be thorough when checking items and recording information. Staff should not copy information from one form to the next without verifying the information is correct. When a manager or QA staff review documents, they need to be certain they know what the correct information should be before approving.

The tank concentrations are close enough to each other that the error introduced into the analyzers were likely negligible (according to the NPAP results).

6) Maintenance records are not thorough and organized.

The project SOPs specify that certain maintenance procedures will occur yearly or every two years (rebuilding analyzer pumps, replacing converters, replacing lamps, etc). The completion of these maintenance items is only recorded on Station Log forms. How do the field techs know when it's time to perform maintenance if they have to search through these records to see when the last time the item was completed? Due to the unorganized nature of the forms and missing dates, the auditors could not clearly identify when and if these tasks were last completed.

The Station Log forms and Analyzer Checklist forms were often missing the year they were completed (Figures 13 and 14). When searching through the documents the auditors had to look at other sheets to try and assess the chronological order of the forms.

The original Station Logs are supposed to be sent to Anthony Galligan at the AECOM office and carbon copies are kept in the stations. When the auditors were in Fort Collins visiting AECOM, the original 2019 forms were unavailable. At two of the sites (North East and South West), the carbon copies were just loose in piles. At the In-Town site some of the records were in a three ring binder, but this binder was too full to add new pages. Additionally, some of the pages were damaged by water.

Recommendation: Project records are extremely important. Each form field should always be completed (such as adding the year to each date). The records should be maintained as specified in the QMP/QAPP and should be kept safe and organized for easy reference. Records should not be removed from their proper storage area.

Equipment maintenance is also extremely important, as proper maintenance usually leads to better data quality and fewer unplanned disruptions. Having a maintenance schedule is necessary, but so too is adhering to the schedule and thoroughly recording the completion of each maintenance item. We recommend that Sinclair develop a separate maintenance checklist form for the stations. It should indicate the required maintenance items and schedule, and should be filled out when the items are completed. This form would allow the field staff to know when a maintenance item is due and would inform project management if the maintenance items are being completed on time.

7) **There is a lack of training and training documentation.**

The QMP/QAPP specifies that training documentation for the on-site technicians is stored in the on-site log. After speaking with Chris Schumacher and Anthony Galligan, it doesn't appear the on-site technicians have been trained. As new employees perform project task and new equipment are installed (as it was recently in the North East station), staff need to be trained on their duties.

Proper training could have prevented a number of the findings in this report (quarterly MFC calibrations, maintenance record completion and accuracy, proper cylinder identification, etc).

Recommendation: AECOM and Sinclair should develop a training plan for their staff, as noted in the QMP/QAPP. The training should be recorded as it is completed. The station log is not be an appropriate location to record the training. There should be training forms to indicate what tasks were included in the training and a location for the trainer and trainee to sign when completed.

8) **Performance Evaluations and NPAP audits are not conducted with independent personnel and equipment.**

When referring to NPAP audits, the Appendix A to CFR Part 58 Section 3.1.3.4 states that "In addition to meeting the requirements in sections 3.1.3.1 through 3.1.3.3 of this Appendix, the PQAO must:(a) Utilize an audit system equivalent to the federally implemented NPAP audit system and is *separate from equipment used in annual performance evaluations* [emphasis added]." Additionally, Appendix A 3.1.2.3 states "The gas standards and equipment used for the performance evaluation must not be the same as the standards and equipment used for one-point QC, calibrations, span evaluations *or NPAP* [emphasis added]."

The Sinclair project contracts EEMS to complete quarterly audits of their stations, but EEMS uses the same standards for all audits. Therefore, all the audits are either NPAP audits, or all the audits are performance evaluations, but they cannot be both. If these audits are all annual performance evaluations, the 09/22/2017 and 09/16/2018 performance evaluations were incorrectly reported as an NPAP audits.

Recommendation: Sinclair needs to correct their QMP/QAPP so that the NPAP and performance evaluation equipment and are unique. Potentially EEMS could send a different audit vehicle once a year or AECOM staff could conduct the performance evaluations and EEMS conducts the NPAP audits.

All audit records in AQS should be updated to reclassify the NPAP audits as performance evaluations or all the performance evaluations as NPAP audits.

9) **Incomplete data quality systems audits.**

The Sinclair QMP/QAPP Section C.1.4 states that "the data quality system audit will consist of an annual evaluation of the project data management tools and process. This audit will be carried out by the Quality Assurance [Manager] listed in Table A.3." Section C.2.2 indicates that this

audit will be included in the quarterly data reports. Additionally, Table 21 indicates that the data quality system audits will be included in the second calendar quarter report. Appendix E of the QMP/QAPP is still titled "Examples of Systems, Data Quality, and Performance Audits", but only contains an example of a performance audit.

Dustin Rapp is listed as the Quality Assurance Manager in Table A.3. Interviews with Anthony Galligan and Dustin Rapp revealed that the Quality Assurance Manager reviews quarterly reports and provides comments, but no data quality systems audits are completed.

Recommendation: Either the QMP/QAPP should be updated with the current practice, or the Quality Assurance Manager should start conducting data quality system audits.

10) **The calibration action limits have been exceeded without any recorded corrective action.**

The Sinclair QMP/QAPP Section B.5.2.1 Calibration Checks indicate that the "action limit for calibrations checks is ±5 percent of the known input for non-zero points and ±1.5 percent of analyzer full scale for the zero point." The initial calibration of the North East NO_x analyzer on 1/24/2017 has a maximum difference of -5.9 % NO_2, and the final has a maximum difference of -6.9 %, but it appears no additional action was taken.

On 2017 Q2 AECOM NO_x/GPT Calibration/Audit Form completed on 5/17/2017 (I believe this is the date, but the date incorrectly states 1/24/2017), the maximum percent different of the NO_2 point is -7.9 %, but there is no indication that another calibration/audit was performed. The PASS/FAIL criteria even indicated a warning.

Recommendation: The QMP/QAPP should indicate what actions will be taken when an action limit is exceeded. When an analyzer is calibrated and can't meet the action limit for a calibration, that should result in a corrective action. If a corrective action was taken, it was not properly documented.

11) **Corrective actions are not initiated in a timely manner**

Section C.2.4 of the QMP/QAPP indicates that "Any monitoring equipment problems or issues that are identified during calibration or audit visits, regular site visits, or during data review process, will be documented and reported to the Project Manager within 3 business days of discovery. All monitoring equipment problems that may affect data quality, and the corrective action taken to resolve them will be documented using corrective action request forms and will be discussed in the appropriate data report." There are several instances where monitoring equipment problems or issues were identified, but corrective actions were not initiated or were delayed for an extended period of time.

One example of inaction is the NPAP auditor noted in April 2017 that the "The sample train should be comprised of approved materials which are glass and Teflon only." Two years later this item has yet to be addressed. Another example is the NPAP auditor and WDEQ noted discrepancies between the reported concentration from the data loggers and the analyzers in early 2017. The only corrective action the auditor could identify in the quarterly reports was in the 2018 Q2 report (Section 2.1) where it states that the North East SO_2 monitor was replaced

because "poor audit results utilizing low concentrations and poor agreement between the value reported by the data acquisition system (DAS) and the analyzer display screen." Both of these items affect data quality.

Recommendation: Project personnel should follow the QMP/QAPP and initiate corrective actions in a timely manner and document them appropriately.

12) Quarterly reports have multiple errors on the calibration dates.

In the second quarter of 2017 there are many issues with the calibration forms:

- All the South West calibration forms showing a date of 5/16/2017 have "Last Cal Dates" of the following day (5/17/2017).
- All the North East station calibration forms dated 1/24/2017 show that the last calibrator calibration date was 5/17/2017.
- The North East calibration sheets which should have been dated 5/16/2017 or 5/17/2017, have a date of 1/24/2017 (which is the date of the previous calibrations).
- A North East MFC Calibration sheet shows a location of AECOM Lab, but how is this possible if the date and time are the same as the analyzer calibrations at the Sinclair Refinery?
- The Start and End times for the Initial and Final SO_2 calibrations are the exact same.
- The MFC calibration forms for the In-Town site have the same calibration date and last calibration date (5/16/2017).

These errors are not isolated to the second quarter of 2017, they are common on all the forms in the quarterly reports. Incorrect entries can make it impossible to determine what was completed and when, especially if multiple incorrect entries occur on the same form.

It appears these forms are supposed to be reviewed by the field operations manager and the project manager. If they were reviewed it is concerning that these errors weren't identified. If they were not reviewed, there was a failure in the QA system.

Recommendation: AECOM site technicians need to be trained on how to fill out the project forms (see Minor Finding 7). Entries must be complete and accurate. If there is an initial calibration and a final calibration, they should have different start and end times. The date of a calibration should be later than the date of last calibration (for most situations).

AECOM managers need to execute thorough reviews of project forms. The defensibility of the project data depends on these records, so they need to be accurate.

13) Zero air generators are not challenged on a regular basis as detailed in the QA Handbook Volume II.

Per the data validation template, there are operational criteria for zero air. It states that once per calendar year) the zero air should be verified to make sure the targeted pollutant concentrations are below the lower detection limits. There is currently no documented procedure for performing this test in the Sinclair quality system documents.

Recommendation: Without this zero-air check, there is no acceptance criteria to determine how well the zero air generators (ZAGs) are performing. Appendix K of the 2017 QA Handbook Volume II presents guidance for the use and verifications of ZAG systems. This document should be reviewed and a practice established to ensure the in-station ZAGs are providing acceptable zero air.

7.3. Concerns

1) It appears the South West station needs more frequent maintenance.

The inlet lines were dirty at the South West station (see Figure 14). There is currently construction near the site, and this is probably causing increased dust.

Recommendation: The onsite technicians should be trained on how to determine if the filters or lines need ot be replaced (see Minor Finding 7). AECOM employees should inspect the inlet each visit and make sure the sample lines are clean. If not, they should be replaced. The South West lines should be replaced as soon as possible.

2) The monitoring shelters are missing documentation and contain obsolete documentation.

The Sinclair QMP/QAPP specifies that manuals and QA documents are available at the sites (Section B.6.3). These documents were not present at the sites during the audit. It was noted that a 2011 QMP/QAPP was present at the North East station, but this is not the current version of the QMP/QAPP.

Recommendation: If all these documents are kept electronically, that should be specified in the QMP/QAPP. If the documents are supposed to be stored on-site, then they should be present. Old QMP/QAPPs, SOPs and manuals should be removed from the shelters to avoid confusing staff and potentially causing errors.

3) There is poor shelter maintenance and cleanliness.

The In-Town shelter appears to have a leak, as a number of papers were water damaged. In addition, the overall cleanliness of the shelters was poor. The auditors had to search through boxes and stacks of papers to try and identify where documents may be located.

Recommendation: The shelters should be organized and cleaned. Records should be properly filed and protected from damage. Old documents, equipment and spent supplies should be removed.

4) Sampling conduit appears to be open from the shelter to the inlet at two sites.

The In-Town and North Est shelters have a piece of conduit that attaches to the roof and the inlet cover. The sample line runs through the conduit (Figure 15). The auditor could not identify any plugs in the conduit (Figure 16). The concern is that if the shelters have positive pressure (from

equipment venting into the shelter or from the HVAC system) the air will be forced up through the conduit and sampled by the inlets.

Recommendation: All conduit carrying sampling lines should be plugged to prevent any shelter air from being forced up the conduit and inadvertently sampled.

Appendix A: Figures

Figure 1. Map of Sinclair Air Monitoring Stations

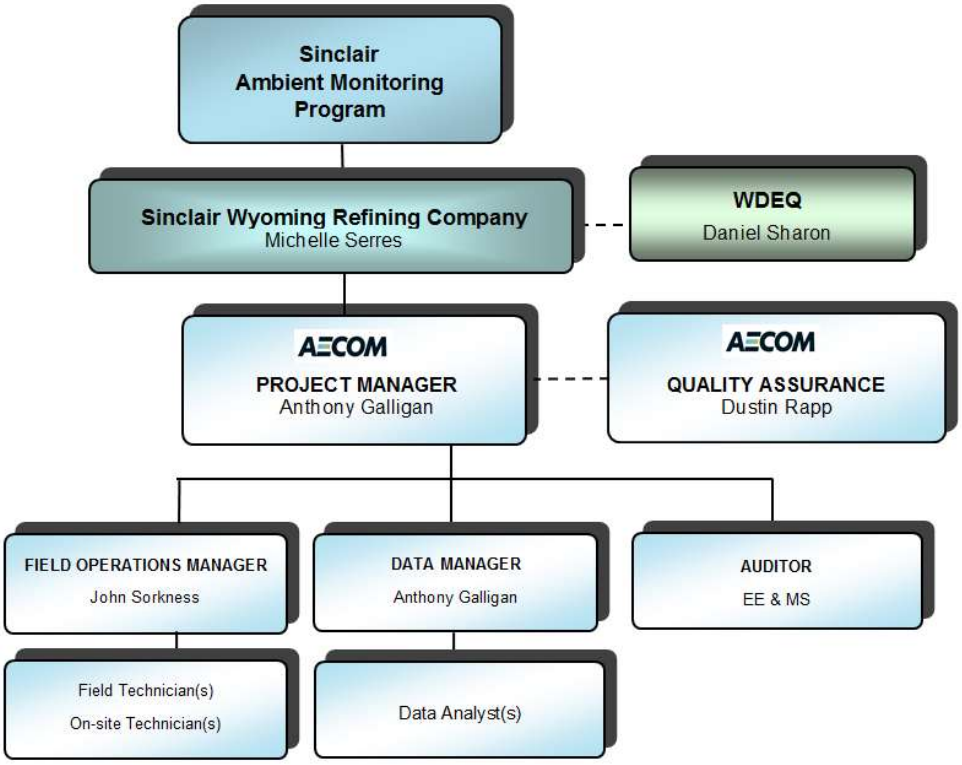


Figure 2. Project Organization from Completed TSA Questionnaire

Figure 3. In-Town Ambient Air Monitoring Station (Facing South)

Figure 4. North East Ambient Air Monitoring Station (Facing West)

Figure 5. South West Ambient Air Monitoring Station (Facing East)

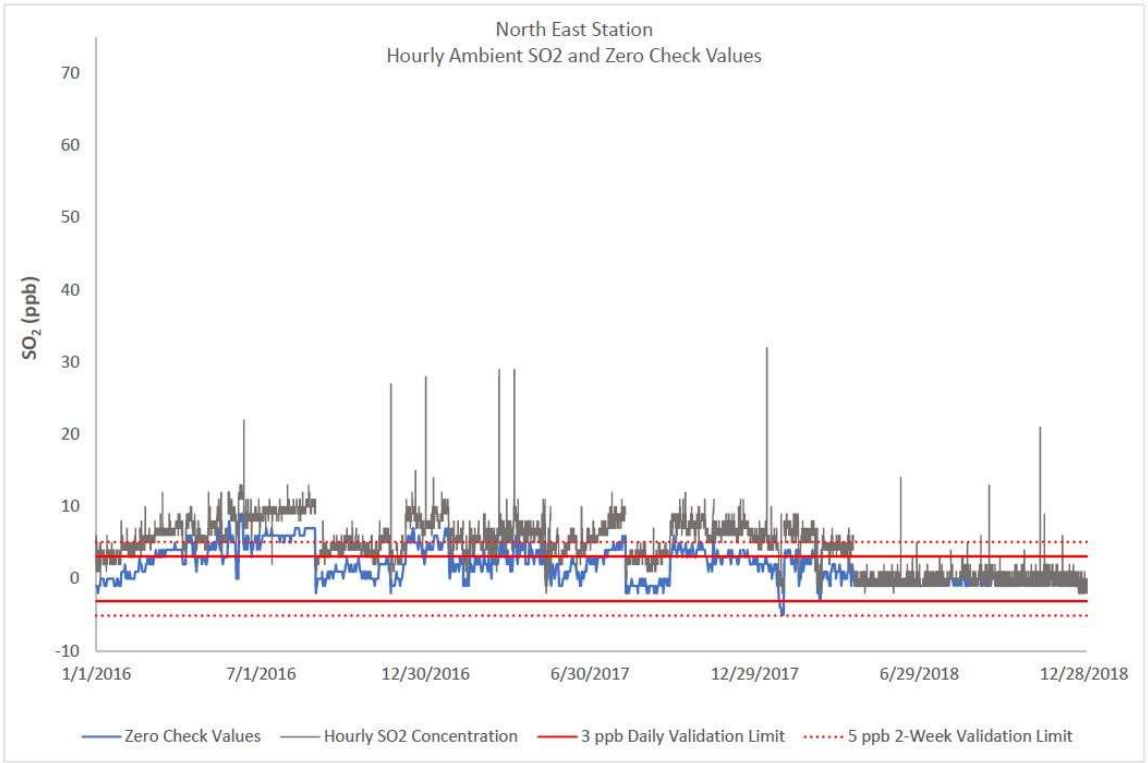


Figure 6. North East Hourly Ambient SO2 and Zero Check Values

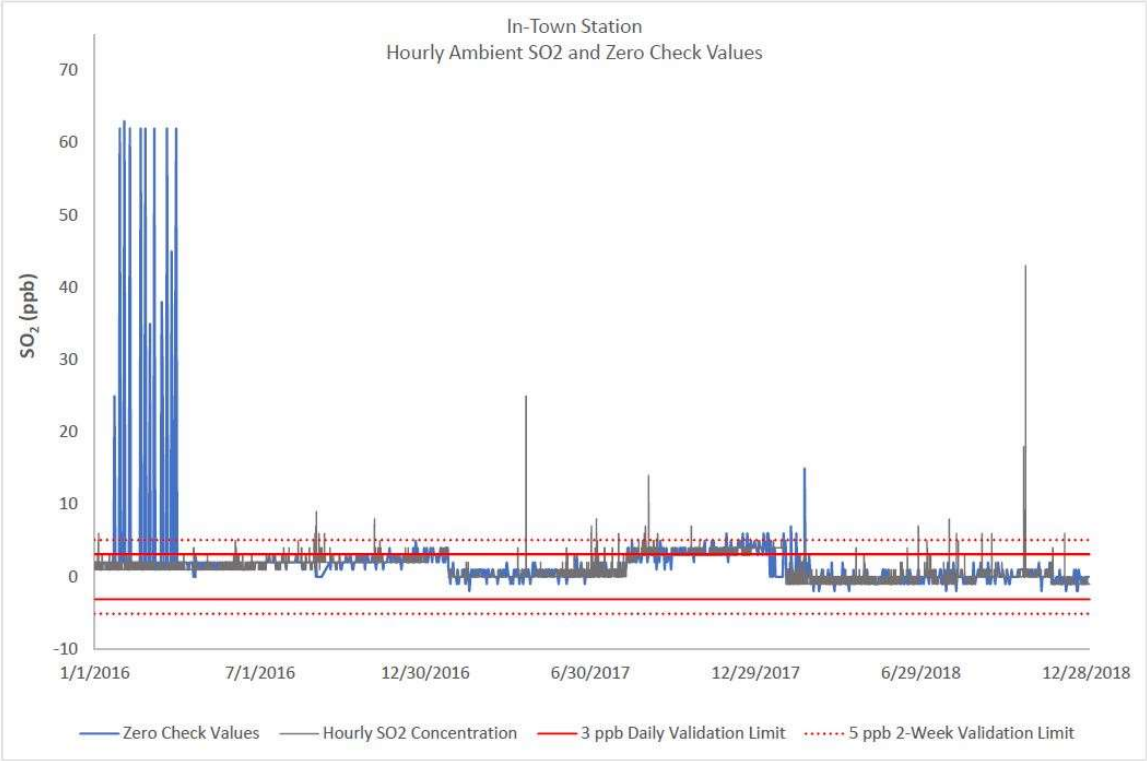


Figure 7. In-Town Hourly Ambient SO2 and Zero Check Values

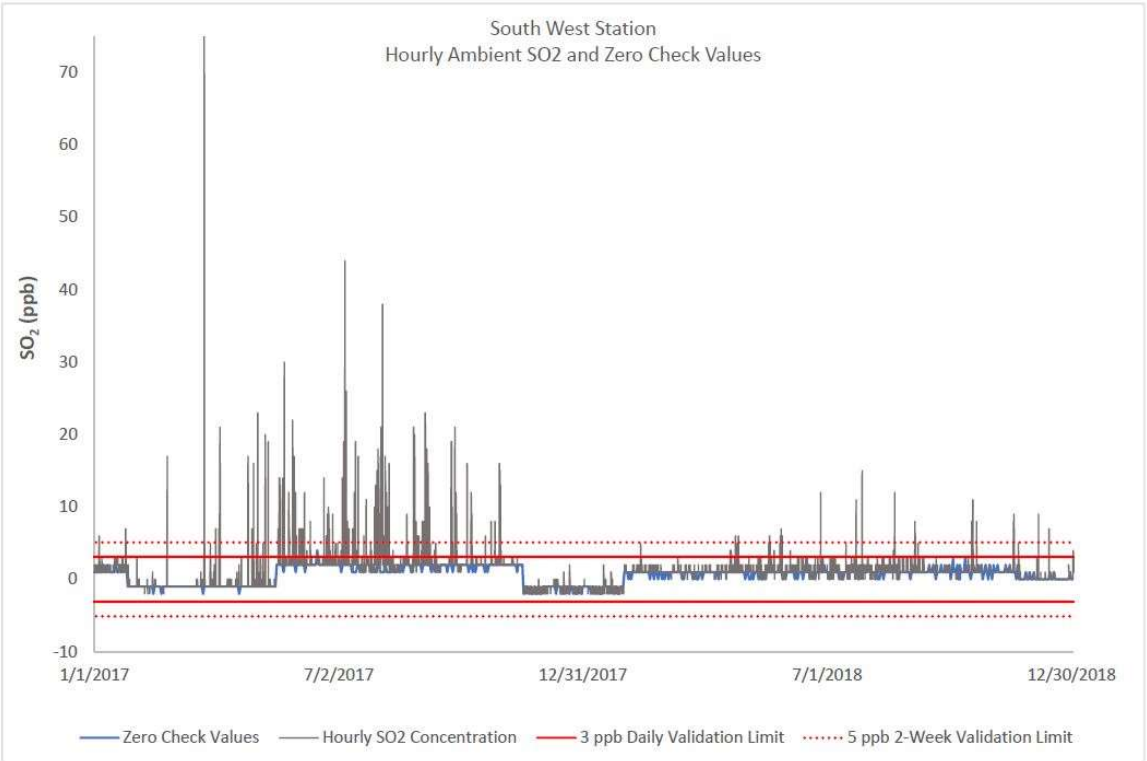


Figure 8. South West Hourly Ambient SO2 and Zero Check Values

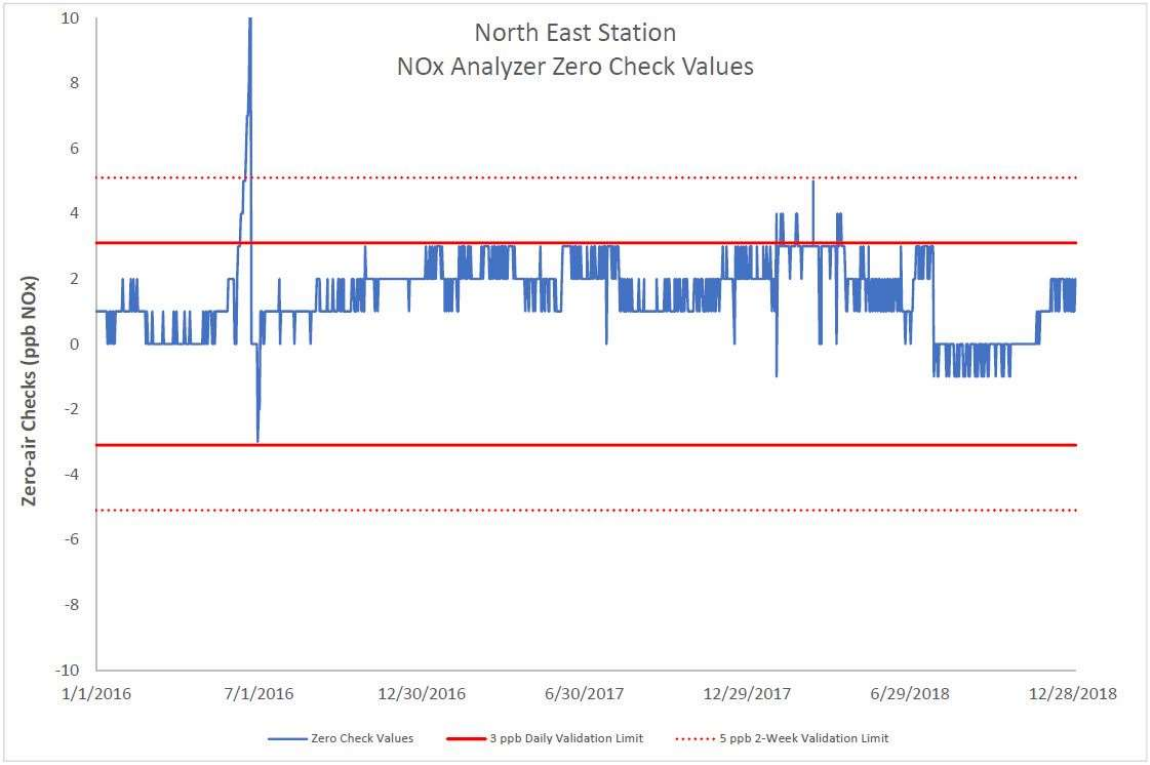
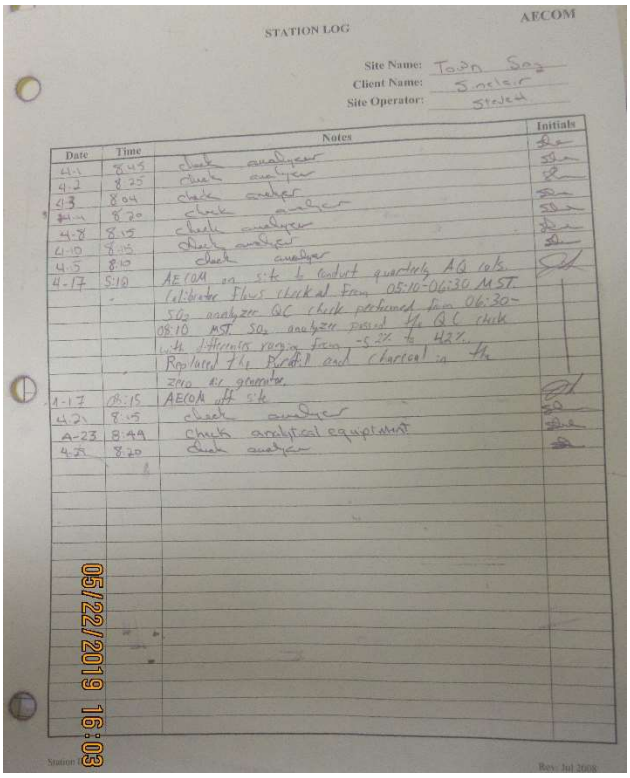


Figure 9. North East Ambient NOx Zero Check Values

Figure 10. The inlet at the South West Station.

Figure 11. The inlet configuration at the South West Station.

Figure 12. The inlet and screen material at the North East Station.



STATION LOG

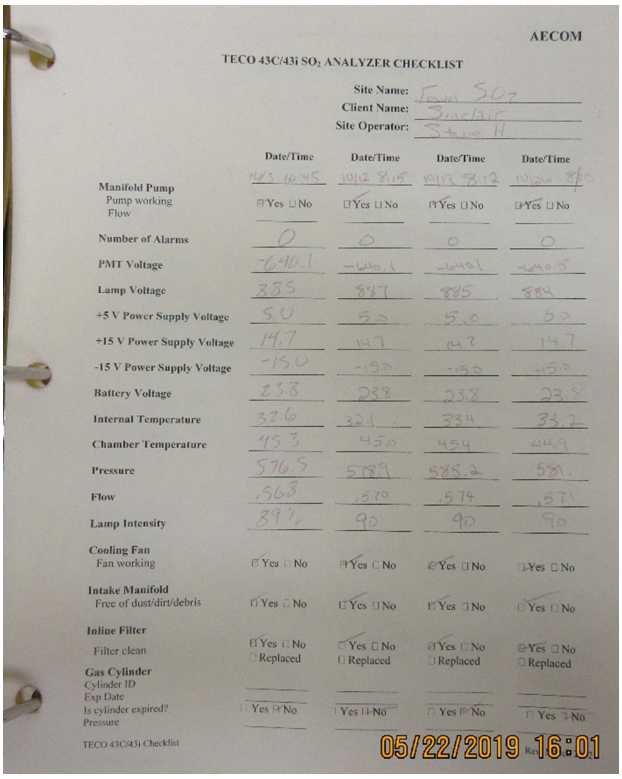
AECOM

Site Name: Town SO2
Client Name: Sinclair
Site Operator: Steve H

Date	Time	Notes	Initials
4-1	8:45	check analyzer	SH
4-2	8:25	check analyzer	SH
4-3	8:04	check analyzer	SH
4-4	8:20	check analyzer	SH
4-8	8:15	check analyzer	SH
4-10	8:15	check analyzer	SH
4-15	8:19	check analyzer	SH
4-17	5:10	AECOM on site to conduct quarterly AQ calb. Calibrator flows checked from 05:10-06:30 MST. SO2 analyzer QC check performed from 06:30-08:10 MST. SO2 analyzer passed the QC check with differences ranging from -5.2% to 4.2%. Replaced the PM2.5 and charcoal in the zero air generator.	SH
4-17	08:15	AECOM off site	SH
4-21	8:45	check analyzer	SH
4-23	8:49	check analytical equipment	SH
4-25	8:20	check analyzer	SH

05/22/2019 16:03

Figure 13. A station log sheet with no year in the date column.



AECOM

TECO 43C/43i SO_2 ANALYZER CHECKLIST

Site Name: Town SO2
Client Name: Sinclair
Site Operator: Steve H

	Date/Time	Date/Time	Date/Time	Date/Time
	10/3 10:45	10/12 8:15	10/17 8:12	10/24 8:10
Manifold Pump Pump working Flow	☑ Yes ☐ No	☑ Yes ☐ No	☑ Yes ☐ No	☑ Yes ☐ No
Number of Alarms	0	0	0	0
PMT Voltage	-640.1	-640.1	-644.1	-640.5
Lamp Voltage	835	847	885	884
+5 V Power Supply Voltage	5.0	5.0	5.0	5.0
+15 V Power Supply Voltage	14.7	14.7	14.7	14.7
-15 V Power Supply Voltage	-15.0	-15.0	-15.0	-15.0
Battery Voltage	23.8	23.8	23.8	23.8
Internal Temperature	32.6	32.1	33.4	33.2
Chamber Temperature	45.3	45.0	45.4	44.9
Pressure	576.5	578.9	585.2	581.
Flow	.568	.570	.574	.571
Lamp Intensity	89%	90	90	90
Cooling Fan Fan working	☑ Yes ☐ No	☑ Yes ☐ No	☑ Yes ☐ No	☐ Yes ☐ No
Intake Manifold Free of dust/dirt/debris	☑ Yes ☐ No	☑ Yes ☐ No	☑ Yes ☐ No	☐ Yes ☐ No
Inline Filter Filter clean	☑ Yes ☐ No ☐ Replaced	☑ Yes ☐ No ☐ Replaced	☑ Yes ☐ No ☐ Replaced	☑ Yes ☐ No ☐ Replaced
Gas Cylinder Cylinder ID				
Exp Date				
Is cylinder expired?	☐ Yes ☑ No	☐ Yes ☑ No	☐ Yes ☑ No	☐ Yes ☑ No
Pressure				

TECO 43C/43i Checklist

05/22/2019 16:01

Figure 13. An analyzer checklist with no date in the Date/Time field.

Figure 14. The inlet line to the South West station. Dirt is visible inside the quarter inch Teflon lines.

Figure 15. The sample line at the In-Town Station.

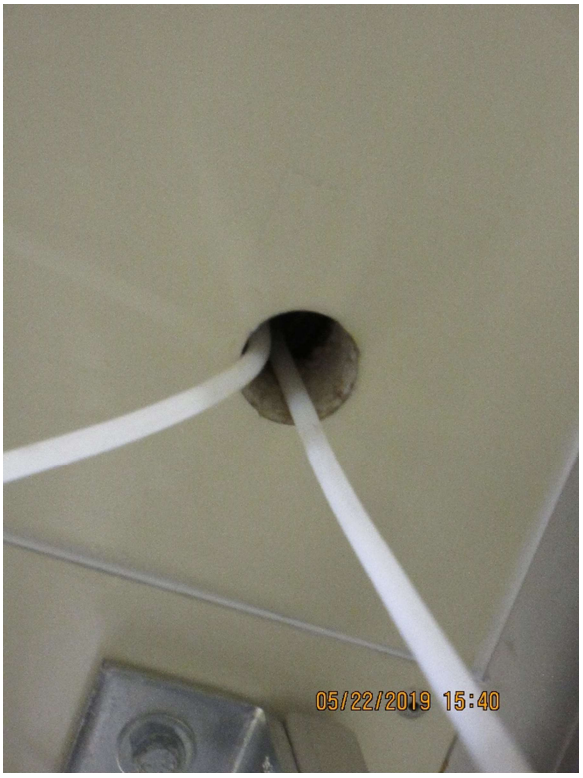


Figure 16. Where the sample and calibration lines enter the conduit on the roof of the In-Town Station.